

CUP-SHAPED PLATING DEVICE

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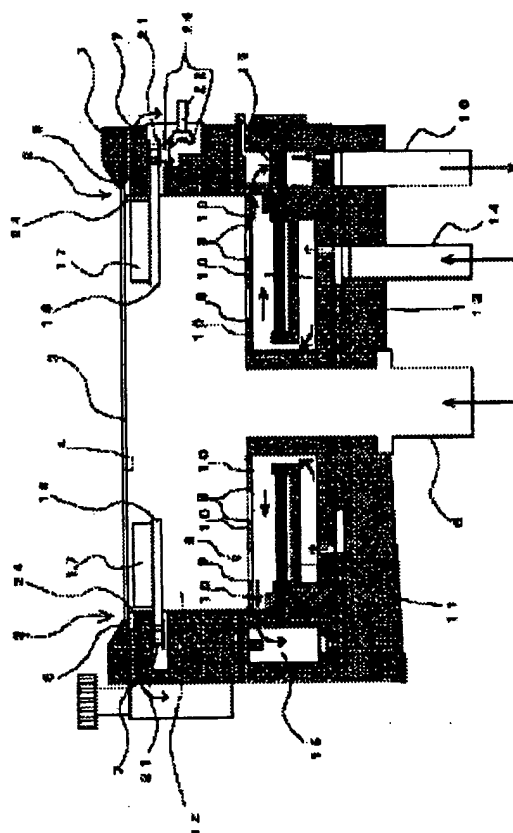
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Abstract of JP2001064795

PROBLEM TO BE SOLVED: To provide a technology to implement a more uniform plating over the whole surface to be plated by improving the non-uniform plating around the surface to be plated caused by the flowing condition of the plating solution in a conventional cup-shaped plating device.

SOLUTION: The cup-shaped plating device comprising a wafer support part 2 formed along an upper opening of a plating tank 1, a solution outflow passage 7 disposed on a lower position of the wafer support part 2, and a solution feed pipe 6 disposed on a bottom part of the plating tank 1, which implements the plating by forming a flow flowing outside the plating tank 1 from the solution outflow passage 7 in the plating solution fed from the solution feed pipe 6 in the rising flow, and bringing a surface 4 to be plated of a wafer 3 placed on the support part in contact with the plating solution, stirring means 17, 18 to forcibly stir the plating solution to be fed in the plating tank 1 are provided on a lower part of the surface 4 to be plated of the placed wafer 3.



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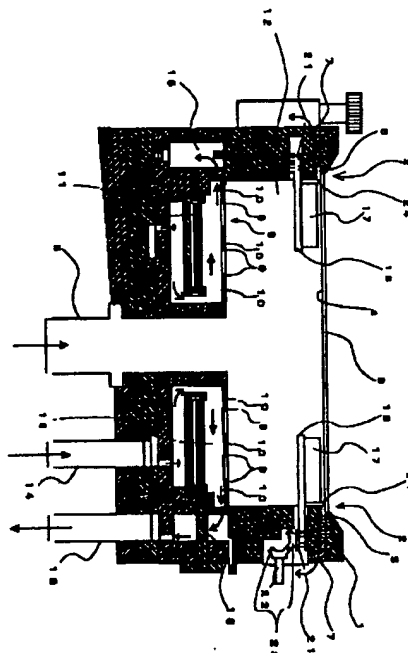
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(54)【発明の名称】 カップ式めっき装置

(57)【要約】

【課題】 従来のカップ式めっき装置におけるめっき液の流動状態により生じていた、めっき対象面周辺における不均一なめっき処理を改善し、めっき対象面全面で、より均一なめっき処理ができる技術を提供する。

【解決手段】 めっき槽1の上部開口に沿って設けられたウェーハ支持部2と、ウェーハ支持部2の下側位置に設けられた液流出路7と、めっき槽1底部に設けられた液供給管6とを備え、液供給管6から上昇流で供給されるめっき液に液流出路7からめっき槽1の外部へ流出する流れを形成させ、このめっき液に支持部に載置されたウェーハ3のめっき対象面4を接触させることで、めっき処理を行うようになっているカップ式めっき装置において、載置されたウェーハ3のめっき対象面4の下方に、めっき槽1内へ供給されるめっき液を強制的に攪拌する攪拌手段17、18が設けられたものとした。



【特許請求の範囲】

【請求項1】 めっき槽の上部開口に沿って設けられたウェーハ支持部と、このウェーハ支持部の下側位置に設けられためっき槽の内部から外部に貫通する液流出路と、めっき槽底部に設けられた液供給管とを備え、液供給管から上昇流で供給されるめっき液に液流出路からめっき槽の外部へ流出する流れを形成させ、このめっき液に支持部に載置されたウェーハのめっき対象面を接触させることで、めっき処理を行うようになっているカップ式めっき装置において、

載置されたウェーハのめっき対象面の下方に、めっき槽内へ供給されるめっき液を強制的に攪拌する攪拌手段が設けられたことを特徴とするカップ式めっき装置。

【請求項2】 攪拌手段は、めっき対象面の周辺下方付近におけるめっき液流動を強制的に変更させるための攪拌翼が設けられたドーナツ形状の円板と、該円板をめっき対象面と平行に支持するとともに、液供給管から供給されるめっき液の上昇流に対して垂直に回転させることができる駆動機構とからなる請求項1に記載のカップ式めっき装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は半導体用のウェーハにめっきを施すカップ式めっき装置に関するものである。

【0002】

【従来の技術】従来より、半導体用のウェーハにめっきを施す装置として、カップ式めっき装置が知られている。このカップ式めっき装置は、めっき槽の上部開口に沿って設けられたウェーハ支持部と、このウェーハ支持部の下側位置に設けられためっき槽の内部から外部に貫通する液流出路と、めっき槽底部に設けられた液供給管とを備え、液供給管から上昇流で供給されるめっき液に液流出路からめっき槽の外部へ流出する流れを形成させ、このめっき液に支持部に載置されたウェーハのめっき対象面を接触させることで、めっき処理を行うようになっている。

【0003】このカップ式めっき装置は、めっき液をめっき対象面に向けて上昇流で供給する結果、めっき対象面には、その中央付近から周辺方向に広がるような流動状態でめっき液が接触することとなり、めっき対象面全面に均一なめっき処理が行えるという特長を有するものである。そして、ウェーハ支持部へ載置するウェーハを順次取り替えてめっき処理を行うことができるので、小ロット生産やめっき処理の自動化に好適なものと広く利用されている。

【0004】

【発明が解決しようとする課題】しかしながら、このカップ式めっき装置では、ウェーハ支持部の下側位置に設けられている液流出路とウェーハ支持部に載置されたウ

ェーハのめっき対象面との間に、僅かな段差が生じて角部を形成するため、その角部にめっき液の流動が滞留し、その影響により、めっき対象面の周辺部分におけるめっき処理が不均一になるという現象がある。このことは、ウェーハの使用可能面積を制限するので、歩留まり的に好ましくなく、よりウェーハの使用面積を大きくできるような技術が求められている。

【0005】また、昨今の微細配線加工技術の発達に伴い、ウェーハ表面に施される回路パターンも、非常に微細なものが加工されるようになっており、そのような微細配線加工がなされたウェーハ表面をめっき対象面にしても、より均一なめっき処理を行える技術が要求されてきている。

【0006】これらの要求に対して、従来のカップ式めっき装置では、めっき対象面におけるめっき液の流動状態が、その中央付近から周辺方向に広がるような流れを定常的に形成するため、微細配線が施されたものに対して、めっき対象面全面で、より均一なめっき処理を行うには、今ひとつ満足できるものではなかった。また、ウェーハのめっき対象面周辺にまで亘り、より広い面積で均一なめっき処理を施すにも限界があった。

【0007】そこで、本発明は、従来のカップ式めっき装置におけるめっき液の流動状態により生じていた、めっき対象面周辺における不均一なめっき処理を改善するとともに、めっき対象面全面で、より均一なめっき処理が可能となるカップ式めっき装置を提供せんとするものである。

【0008】

【課題を解決するための手段】このような目的のために本発明では、めっき槽の上部開口に沿って設けられたウェーハ支持部と、このウェーハ支持部の下側位置に設けられためっき槽の内部から外部に貫通する液流出路と、めっき槽中央底部に設けられた液供給管とを備え、液供給管から上昇流で供給されるめっき液に液流出路からめっき槽の外部へ流出する流れを形成させ、このめっき液に支持部に載置されたウェーハのめっき対象面を接触させることで、めっき処理を行うようになっているカップ式めっき装置において、載置されたウェーハのめっき対象面の下方に、上昇流で供給されるめっき液を強制的に攪拌できる攪拌手段を設けるものとした。

【0009】従来のカップ式めっき装置では、上昇流で供給されためっき液が、めっき対象面の中央付近から周辺方向に広がる流動状態を定常的に形成するため、めっき液中のめっき金属イオンは、めっき対象面の周辺部と中心付近とで、その供給量の差異が生じやすくなり、特に電流密度を高くすると中心付近と周辺方向でのめっき性状が、不均一なものとなる傾向がある。ところが、本発明のカップ式めっき装置によれば、液供給管より供給されるめっき液の上昇流は、攪拌手段により、その流動方向を変えられるため、めっき対象面全面から見ると、

比較的ランダムな流動状態となつて接触する。従つて、めっき対象面の全面に、めっき金属イオンが均一的に供給されることになり、非常に均一性の高いめっき処理が実現できる。また、めっき液は比較的ランダムな流動状態を形成して、めっき対象面に接触することになるので、めっき液の流動状態によって生じやすい、液流れ状の不均一なめっき外観も生じなくなる。

【0010】本発明における攪拌手段は、上昇流で供給されるめっき液を攪拌できるものであれば、どのようなものでもよい。例えば、複数のインペラを有した攪拌翼をめっき対象面の下方位置に配置して回転させるようにしたり、液供給管から供給されるめっき液の上昇流を、妨げるように、めっき液を噴射するようなポンプ機構などを別途設けて行うことも可能である。要するに、供給されるめっき液の上昇流によって生じる、めっき対象面でのめっき液流動状態を変更できるような手段であれば、いずれを選択してもよいものである。

【0011】本発明のカップ式めっき装置では、攪拌手段は、めっき対象面の周辺下方付近におけるめっき液流動を強制的に変更させるための攪拌翼が設けられたドーナツ形状の円板と、該円板をめっき対象面と平行に支持するとともに、液供給管から供給されるめっき液の上昇流に対して垂直に回転させることができる駆動機構とからなるものとするのが好ましい。

【0012】このようにすると、上昇流で供給されためっき液は、ドーナツ形状の円板における開口を通過して、めっき対象面にある程度到達することができ、そして、めっき対象面の周辺方向に広がるようなめっき液の流動状態は、攪拌翼により変更されることになる。従つて、ウェーハ支持部の下側位置に設けられている液流出路とウェーハ支持部に載置されたウェーハのめっき対象面との間での僅かな段差におけるめっき液の流動が滞留する現象は、解消されることになり、めっき対象面の周辺部分においても均一なめっき処理が施せるものとなる。

【0013】この場合における攪拌翼は、めっき対象面の周辺下方付近におけるめっき液流動を強制的に変更できるような形状であれば、どのようなものでもよい。めっき対象面におけるめっき液の流動状態を効率的に変更するには、この攪拌翼はめっき対象面の近傍に位置するように配置することが、より好ましいものである。また、ドーナツ形状の円板における開口は、めっき液の液供給管の位置や大きさに合わせて、適宜、その形状、開口面積等を決定すればよく、上昇流で供給されるめっき液がめっき対象面にある程度到達できるようにされていればよいものである。

【0014】

【発明の実施の形態】以下、本発明に係るカップ式めっき装置の好ましい実施形態について説明する。図1は本実施形態におけるカップ式めっき装置のめっき槽断面

概略を表したものである。図1で示すように、本実施形態におけるカップ式めっき装置は、めっき槽1の上部開口に沿つてウェーハ支持部2が設けられており、このウェーハ支持部2にウェーハ3を載置して、ウェーハ3のめっき対象面4に対してめっき処理が行われるものである。このウェーハ支持部2は、図示を省略するカソードとその下にあるめっき液漏洩防止用のシールパッキン5とにより構成されている。

【0015】また、めっき槽1の底部中央には、主めっき液供給管6が設けられており、ウェーハ支持部2の下側位置には、めっき対象面4の中心付近に到達するめっき液がウェーハ2の外周に向かう方向に広がる流れを形成するように外部に溢出させるための主めっき液流出路7が設けられている。

【0016】そして、めっき槽1内には隔壁8が配置されている。この隔壁8は、めっき槽1の横断面形状に一致する円盤状に形成され、主めっき液供給管6に差し込まれた状態でめっき槽1内に固定している。そして、この隔壁8には、多数の開口9、9、9・・・を穿設しており、各開口9、9、9・・・には、各開口9を覆うように隔膜10を配している。ここで各開口9は、主めっき液供給管6を中心とした同心円上に等間隔に配置されている。この隔膜10は、めっき液に対して耐薬品性を有し、絶縁性の材料で形成された多孔性の膜であり、めっき液中のイオンを介してアノードとウェーハ3との電導が行える特性を有したものである。

【0017】そして、隔壁8下方には、主めっき液供給管6の周囲に配置できるように、円盤状に形成されたアノード11が設けられている。めっき槽1内は、隔壁8によって、上方にウェーハ側隔離室12を、下方にアノード側隔離室13を形成している。このアノード側隔離室13には、めっき槽1底側より、主めっき液供給管6とは別にめっき液を供給するための補助めっき液供給管14が設けられ、アノード側隔離室13の外側に、アノード側隔離室13に供給されためっき液を排出する補助めっき液貯留室15が設けられている。そして、補助めっき液貯留室15には、補助めっき液を排出する補助めっき液排出管16が設けられている。

【0018】ウェーハ側隔離室12には、めっき対象面4の下方位置へ、複数のインペラ17が立設されたドーナツ形円板18が配置されている。このインペラ17は、その上端がめっき対象面4に近接する位置になるよう配置されている。このドーナツ形円板18は、平面図で見ると、図2に示すようになっており、中央に開口19が設けられ、インペラ17が放射状に配置されているものである。また、ドーナツ形円板18の外周側には歯車部20が形成されている。そして、このドーナツ形円板18は、主めっき液流出路7の下側位置で、めっき対象面4と平行になるように、複数のプーリー21と歯車部20とが咬合することにより支持されている。プーリ

ー21の一つは、駆動シャフト22に連動するようにされたベベルギア23と接続されている。

【0019】主めっき液供給管6より上昇流で供給されためっき液は、ドーナツ形円板18の開口19を通過してめっき対象面4に到達し、めっき対象面4の外周に向かう方向に広がるようなめっき液の流動状態を形成する。この際、駆動シャフト22によりベベルギア23を介してプーリー21を回転させることにより、ドーナツ形円板18が、めっき液の上昇流に対して垂直に回転することになる。そして、このドーナツ形円板18のインペラ17により、めっき対象面4における外周に向かう方向に広がるめっき液の流動状態は変更されることになる。特に、主めっき液流出路7とめっき対象面4とので形成される角部24では、めっき液流動の淀みが生じやすいものであるが、このインペラ17の攪拌により、角部24にもめっき液が十分に流動することになる。

【0020】本実施形態で示したカップ式めっき装置を用いて、ウェーハにめっき処理を行った結果、めっき対象面の中心付近と周辺部とのめっき性状の相違も生じず、均一なめっき処理が行えた。また、めっき液の定常的な流動状態によって生じやすい、液流れ状の不均一なめっき外観も確認されなかった。

【0021】

【発明の効果】本発明のカップ式めっき装置によれば、めっき対象面全面で、より均一なめっき処理が可能となり、めっき対象面周辺部分で生じ易い不均一なめっき処理を解消することが可能となる。

【図面の簡単な説明】

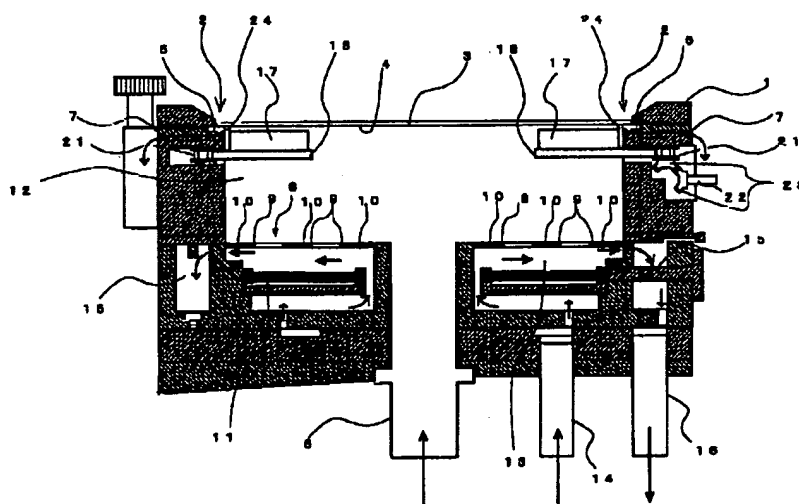
【図1】本実施形態におけるカップ式めっき装置のめっき槽断面図。

【図2】ドーナツ形円板の平面図。

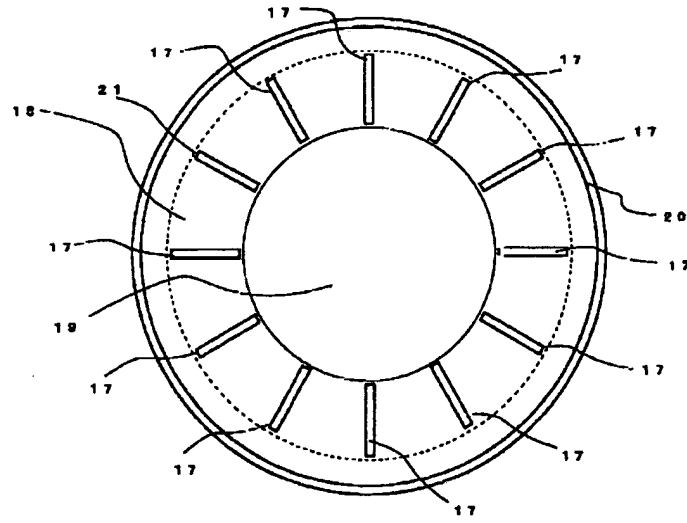
【符号の説明】

- 1 めっき槽
- 2 ウェーハ支持部
- 3 ウェーハ
- 4 めっき対象面
- 5 シールパッキン
- 6 主めっき液供給管
- 7 主めっき液流出路
- 8 隔膜
- 9 開口
- 10 隔膜
- 11 アノード
- 12 ウェーハ側隔離室
- 13 アノード側隔離室
- 14 補助めっき液供給管
- 15 補助めっき液貯留室
- 16 補助めっき液排出管
- 17 インペラ
- 18 ドーナツ形円板
- 19 開口
- 20 歯車部
- 21 プーリー
- 22 駆動シャフト
- 23 ベベルギア
- 24 角部

【図1】



【図2】



PATENT ABSTRACTS OF JAPAN

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(71)Applicant : KOGANEI CORP

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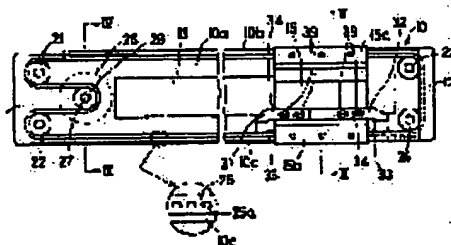
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(54) ELECTRICMOTORDRIVEN LINEAR RECIPROCATING MOTION DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To easily adjust the tension of a belt in an electric-motor-driven linear reciprocating motion device.

SOLUTION: A guide rail 13 is provided along the lengthwise direction in a widthwise direction central part of a housing 10, four driven side pulleys 21 to 24 are rotatably provided in a corner part of the housing 10, a timing belt 25 linked to these driven side pulleys 21 to 24 is provided in a manner surrounding the guide rail 13, the timing belt 25 is connected to a slide block 15 slidably provided in the housing 10, so as to drive the timing belt 25 by a motor 26 having a drive side pulley 28. Both end parts of the timing belt 25 are mounted in the slide block 15 by belt mounting fixtures 31, 32, and they are moved, so that the tension of a belt can be easily adjusted.

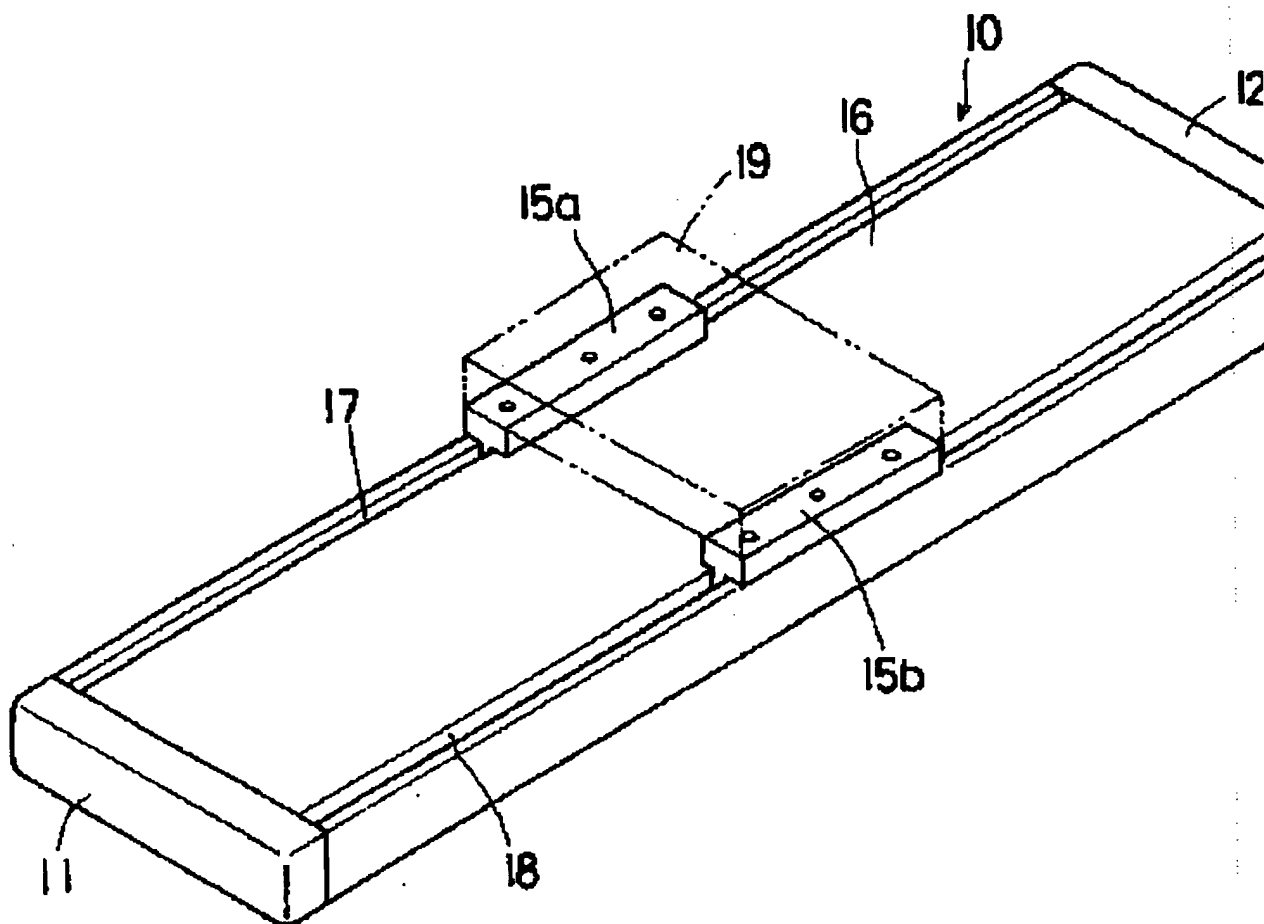


LEGAL STATUS

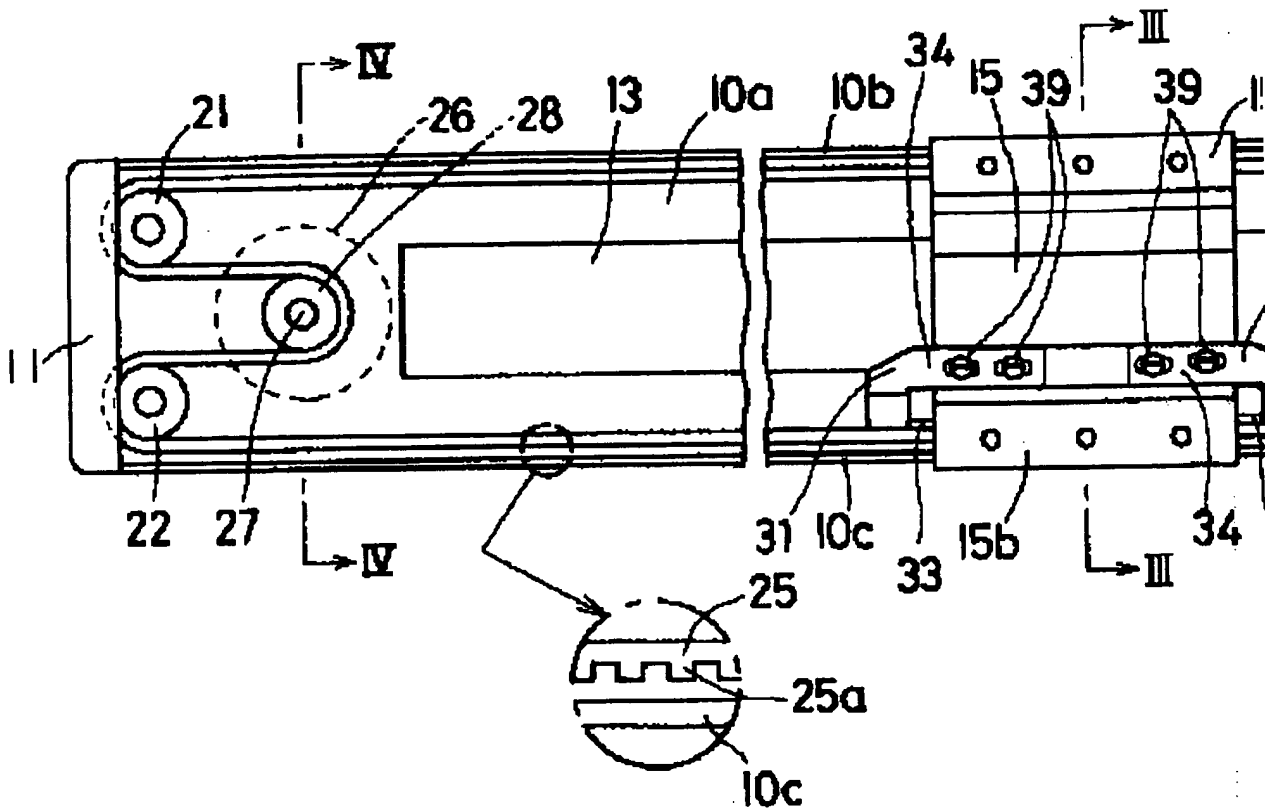
[Date of request for examination] 02.11.2001

[Date of sending the examiner's decision of] 13.07.2004

1



✕ 2



- | | | | | | |
|------|----------|------|----------|------|----|
| 10 : | ハウジング | 22 : | 従動側プーリー | 26 : | モー |
| 13 : | ガイドレール | 23 : | 従動側プーリー | 28 : | 駆動 |
| 15 : | スライドブロック | 24 : | 従動側プーリー | 31 : | ベ |
| 21 : | 従動側プーリー | 25 : | タイミングベルト | 32 : | ベ |

3

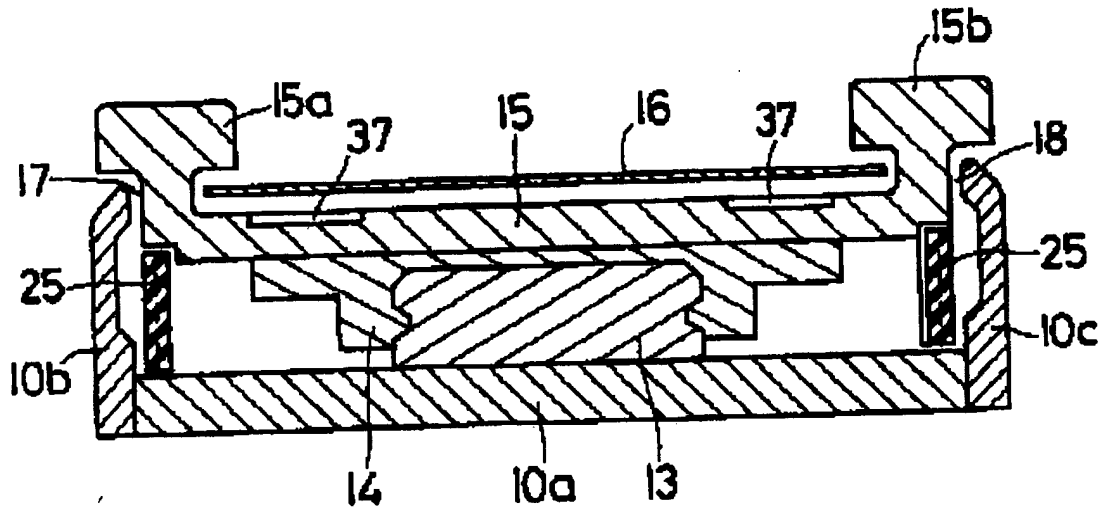


図 4

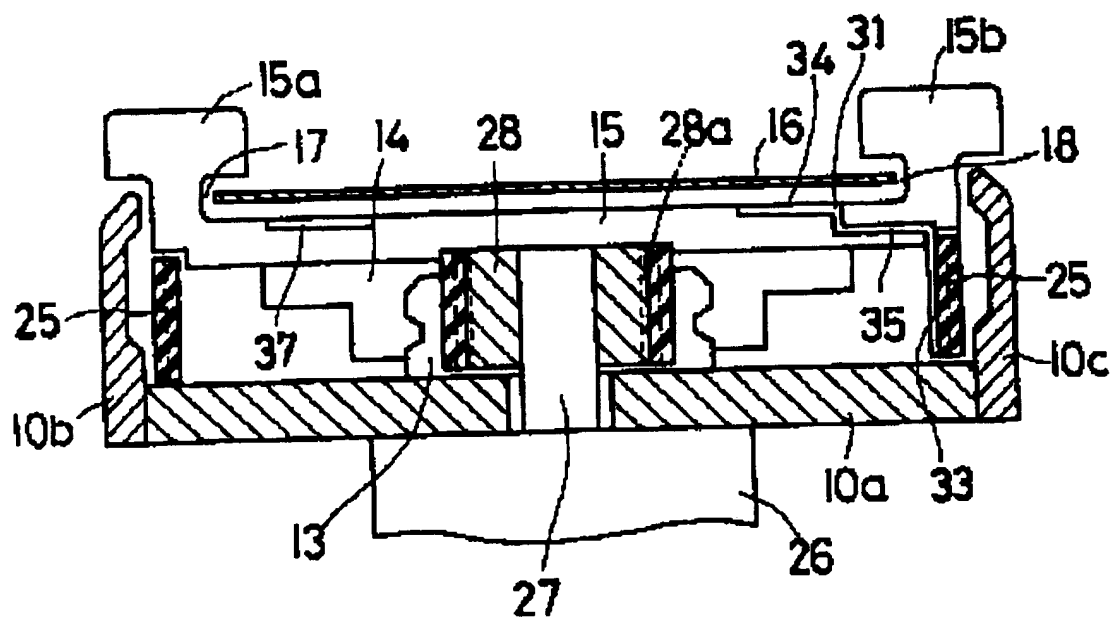
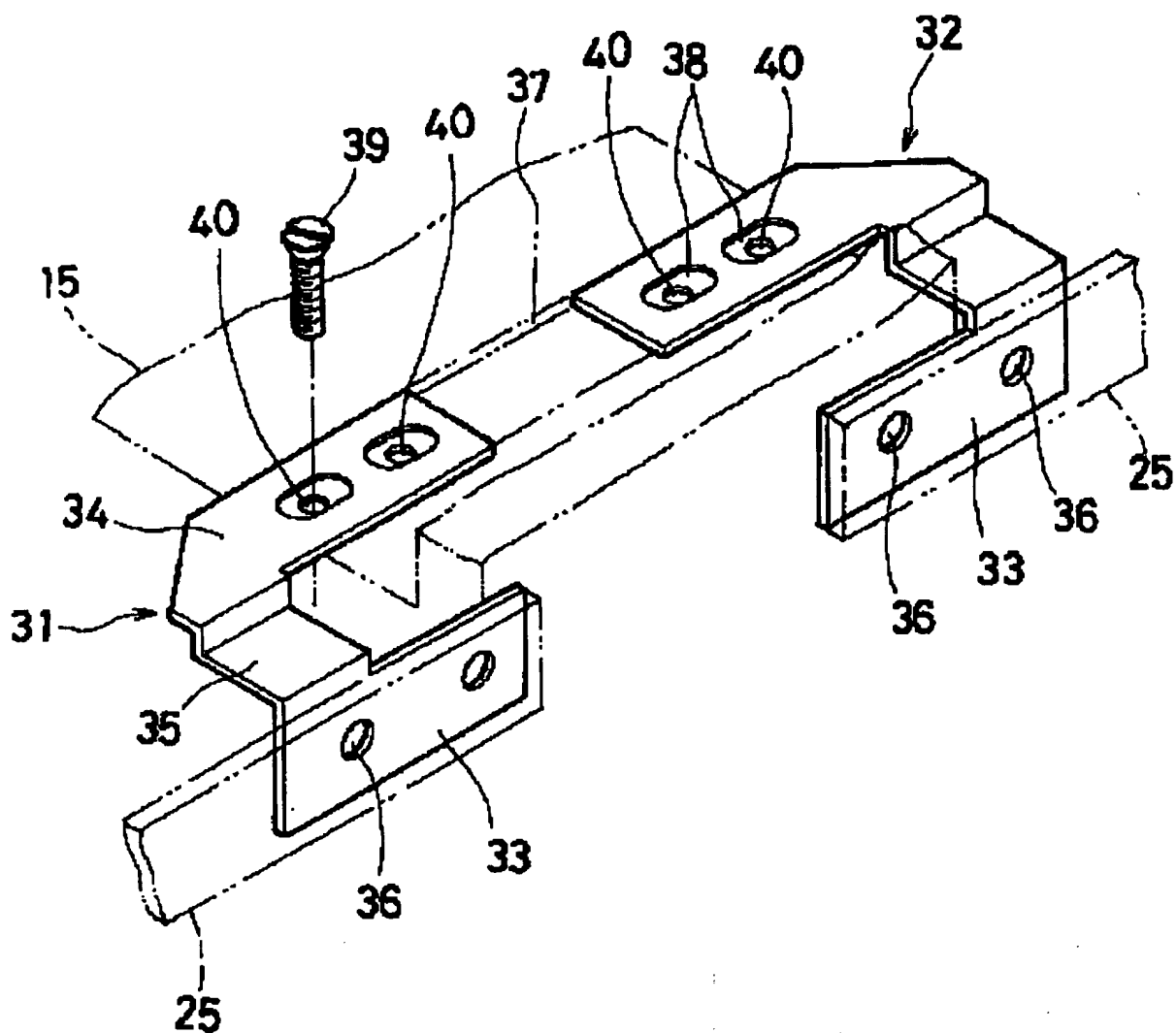


図5



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CLAIMS

[Claim(s)]

[Claim 1] The guide rail which is along a crosswise center section at a longitudinal direction, and housing with which a pulley is prepared in both ends respectively free [rotation], The slide block prepared in the longitudinal direction of said housing free [sliding] along with said guide rail, The belt over which is located in the outside of said guide rail and said pulley is built and which is connected with said slide block, It has two belt fixtures equipped with the conclusion section concluded by the belt fixed part fixed to the edge of the electric motor which drives said pulley, and said belt of predetermined die length, and said slide block, respectively. The through tube which the **** member which was formed in said slide block, and which ****s, ****s to a hole and is combined with it penetrates is formed in each conclusion section of each of said belt fixture. The electromotive straight-line reciprocator characterized by considering as the long hole which turned to the direction where a belt is prolonged in said through tube formed in the conclusion section of one [at least] belt fixture.

[Claim 2] The electromotive straight-line reciprocator characterized by being an electromotive straight-line reciprocator according to claim 1, having prepared said pulley in each of the four corners of said housing, and building said pulley over said belt as said guide rail is surrounded.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates migration members, such as a slide table which supports a work piece, to the electromotive straight-line reciprocator it was made to reciprocate in the direction of a straight line.

[0002]

[Description of the Prior Art] In order to convey a work piece from a certain location to other locations or to move the hand and tool which grasp a work piece between a processing location and an evacuation location, straight-line reciprocation of the migration members, such as a slide table, may be carried out. This straight-line reciprocator is also called a slide unit or slider, and has the thing of a type it was made to drive a migration member through the timing belt driven with an electric motor.

[0003]

[Problem(s) to be Solved by the Invention] As such a straight-line reciprocator, it equips with a slide block free [sliding] along with a guide rail, this slide block is connected with belts, such as a timing belt, and there is a thing of a type it was made to drive this belt with an electric motor.

[0004] Management of components becomes troublesome and using the belt beforehand formed in the shape of a loop formation, if manufacture of two or more kinds of straight-line reciprocators with which the reciprocation stroke of a slide block was mutually different is taken into consideration, although this belt becomes loop formation-like, the shape of i.e., endless, and it will be attached in equipment makes a manufacturing cost it not only cannot to desire improvement in manufacture efficiency, but rise.

[0005] Then, he is trying to form a loop-formation-like belt by concluding the both ends of this to a slide block using the belt which is cut by predetermined die length and has both ends. Therefore, if it is in the electromotive straight-line reciprocator using a belt, the activity which concludes the both ends of a belt to a slide block becomes unescapable.

[0006] ****, **** through the through tube of a belt to a hole, **** a member, and it is made to join together, and although the attempt which formed the through tube in the both ends of a belt, and was formed in the slide block until now and which concludes the both ends of a belt to a slide block was made, tension of a belt cannot be adjusted by this method. In order to adjust the tension of a belt, he is trying to move the pulley built over the belt until now.

[0007] The purpose of this invention is to offer the electromotive straight-line

reciprocator having the belt which can adjust tension.

[0008] The other purposes and the new description will become clear from description and the accompanying drawing of this specification along [said] this invention.

[0009]

[Means for Solving the Problem] It will be as follows if the outline of a typical thing is briefly explained among invention indicated in this application.

[0010] Namely, the electromotive straight-line reciprocator of this invention The guide rail which is along a crosswise center section at a longitudinal direction, and housing with which a pulley is prepared in both ends respectively free [rotation], The slide block prepared in the longitudinal direction of said housing free [sliding] along with said guide rail, The belt over which is located in the outside of said guide rail and said pulley is built and which is connected with said slide block, It has two belt fixtures equipped with the conclusion section concluded by the belt fixed part fixed to the edge of the electric motor which drives said pulley, and said belt of predetermined die length, and said slide block, respectively. The through tube which the **** member which was formed in said slide block, and which ****s, ****s to a hole and is combined with it penetrates is formed in each conclusion section of each of said belt fixture. It is characterized by considering as the long hole which turned to the direction where a belt is prolonged in said through tube formed in the conclusion section of one [at least] belt fixture.

[0011] The tension of a belt can be easily adjusted by moving a belt fixture, without moving a pulley, if it is in this electromotive straight-line reciprocator.

[0012]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail based on a drawing.

[0013] It is III-III [in / drawing 1 is the perspective view showing the appearance of the electromotive straight-line reciprocator which is the gestalt of 1 operation of this invention, and drawing 2 is the top view of drawing 1 in the condition of having removed covering, and / in drawing 3 / drawing 2]. It is the sectional view which meets a line, drawing 4 is a sectional view which meets the IV-IV line in drawing 2 , and drawing 5 is the perspective view showing a belt fixture.

[0014] The electromotive straight-line reciprocator to illustrate has the metal housing 10 which became a rectangle mostly, as this housing 10 is shown in drawing 3 and drawing 4 , it consists of bottom plate 10a and side plates 10b and 10c, and the cross section serves as a cup configuration. The caps 11 and 12 formed in the both ends of this housing 10 with resin, respectively are stopped.

[0015] The slide block 15 is being fixed to the guide block 14 which the guide rail 13 is formed in that crosswise center section along with the longitudinal direction, and was prepared in bottom plate 10a of housing 10 free [sliding] to this guide rail 13 as shown in drawing 2 . Therefore, with guide block 14, a slide block 15 is guided at a guide rail 13, and reciprocates in the direction of a straight line.

[0016] The crosswise center section of this is attached in the covering 16 of a wrap sake by housing 10, and the predetermined clearances 17 and 18 are formed between this covering 16 and the side plates 10b and 10c of housing 10. A direct

work piece is supported, or a slide block 15 has the supporters 15a and 15b which project up through clearances 17 and 18, a work piece is supported through the support table 19 fixed to this part by Supporters 15a and 15b, and a work piece is conveyed by the slide block 15.

[0017] As shown in drawing 2, in housing 10, every 2 a total of four follower side pulleys 21-24 are formed free [rotation] in the corner of the both ends, respectively, and, as for these follower side pulleys 21-24, the peripheral face serves as a flat. These follower side pulleys 21-24 are built over the timing belt 25, one side serves as a flat side, and tooth part 25a is formed in the other side. And the driving-side pulleys 21-24 are built over the timing belt 25 by making into an outside the side in which tooth part 25a was formed. As for tooth part 25a of a timing belt 25, the part is shown in drawing 2, and tooth part 25a of other parts of a plot for convenience omits, and is shown.

[0018] The thing of predetermined die length is used and this timing belt 25 serves as the shape of the shape of endless, i.e., endless, and a loop formation as a whole by concluding those both ends to a slide block 15.

[0019] Since a timing belt 25 is driven, as shown in drawing 4, the motor 26 is attached in bottom plate 10a of housing 10, and the driving-side pulley 28 is being fixed to the shaft 27 of this motor 26. This driving-side pulley 28 is located in the crosswise center section of housing 10, and rather than the follower side [two] pulleys 21 and 22 of housing 10 prepared in the edge on the other hand, is shifted at the longitudinal direction center-section side of housing 10, and is located.

[0020] As shown in drawing 4, it has external-tooth 28a, and the timing belt 25 is built over the driving-side pulley 28 in the part this pushed out from between the follower side [two] pulleys 21 and 22 to the center-section side, and the driving-side pulley 28 gears with tooth part 25a by which tooth part 28a of the driving-side pulley 28 was prepared in the timing belt 25. Therefore, the drive of a timing belt 25 is transmitted to a slide block 15 by driving a motor 26 and driving a timing belt 25.

[0021] Since the follower side pulleys 21-24 are formed in the corner of the both ends of the rectangular housing 10, respectively and these were built over the timing belt 25 so that it might illustrate, a timing belt 25 is arranged so that it may move along with the side plates 10b and 10c of housing 10. On the other hand, since the guide rail 13 for guiding a slide block 15 is formed in the crosswise center section of housing 10 along with the longitudinal direction, the timing belt 25 and the guide rail 13 are arranged so that these may overlap in a longitudinal direction, i.e., the thickness direction of a timing belt 25, in drawing 3 and drawing 4, so that a timing belt 25 may surround a guide rail 13 that is, . Thereby, the dimension of the vertical direction in drawing of housing 10 can be made small, and thin shape-ization of equipment is attained.

[0022] The both ends of a timing belt 25 are attached in the slide block 15 using the belt fixtures 31 and 32, respectively. When the detail of each belt fixture 31 and 32 is shown, it is as drawing 5.

[0023] Each belt fixture 31 and 32 is formed by bending a plate, it has the conclusion section 34 concluded by the belt fixed part 33 to which the edge of a timing belt 25 is fixed, and the slide block 15, and these are connected by the connection section 35. As shown in drawing 4, the belt fixed part 33 became parallel to side plate 10c, and is prolonged in the longitudinal direction of

housing 10.

[0024] Moreover, the conclusion section 34 became a right angle mostly to the belt fixed part 33, is prolonged in parallel, and is prolonged in the longitudinal direction of housing 10 along the front face of a slide block 15. The connection section 35 is bent in the shape of a stage while it is prolonged crosswise [of housing 10]. Although the belt fixed part 33 and the conclusion section 34 have shifted in the vertical direction in drawing 3 and drawing 4 of housing 10 mutually, since it is bent in the shape of a stage, it will be in the condition of having shifted in the vertical direction by the connection section 35, and the belt fixed part 33 and the conclusion section 34 are connected.

[0025] It ****s to each belt fixed part 33, a hole 36 is formed, and the edge of a timing belt 25 is fixed to the belt fixed part 33 by the **** member which ****s to this screw-thread hole 36, and is combined with it. However, you may make it fix the edge of a timing belt 25 using adhesives.

[0026] The slot 37 where the conclusion section 34 of each belt fixture 31 and 32 engages with a longitudinal direction free [sliding] is formed in the front face of a slide block 15, and the conclusion section 34 is concluded by the slide block 15 where a slot 37 is entered. Every two through tubes 38 are formed in the conclusion section 34, and each through tube 38 is the long hole which turned to the direction where a belt is prolonged.

[0027] It ****s to a slide block 15 and the **** hole 40 with which a member 39 ****s and is combined is formed, and the **** hole 40 makes two belt fixtures 31 and 32 correspond, by two, it makes a pair and is formed at a time a total of two pairs. It is separated from two screw-thread holes 40 which form a pair of the distance corresponding to the distance of the center to center of two long holes formed in one belt fixture.

[0028] In order to conclude a timing belt 25 to a slide block 15, while preparing the timing belt 25 which the belt fixtures 31 and 32 ****ed to both ends, and was beforehand fixed to them by the member or adhesives and building each follower side pulleys 21-24 over this timing belt 25, two belt fixtures 31 and 32 are concluded to a slide block 15 using four screw-thread members 39. At this time, where each screw-thread member 39 is loosely attached in the **** hole 40, as the both ends of a timing belt 25 are made to approach mutually, predetermined tension is applied to a timing belt 25.

[0029] Under this condition, by binding the **** member 39 tight, a timing belt 25 serves as predetermined tension, and will be attached in a slide block 15. However, after ****ing the belt fixture 31 where one belt fixture 31 is drawn near to the other end side of a timing belt 25, and binding tight by the member 39, you may make it apply predetermined tension to a timing belt 25, as the belt fixture 32 of another side is turned to one belt fixture 31 and made to approach. It is almost good also as a circular hole corresponding to the **** hole 40, without making into a long hole the through tube 38 of the belt fixture attached first, when such an attachment method is made.

[0030] Since the **** member 39 is attached from the front-face side of a slide block 15 in case the screw-thread member 39 is ****ed, it ****s to a hole 40 and it joins together, the screw-thread stop activity can be done easily. Moreover, when a timing belt 25 loosens by [predetermined] carrying out period use of the equipment, prevention of slack of a timing belt 25 and adjustment of tension can be easily performed by carrying out adjustment migration so that one [at least] belt

fixture 31 may be turned and brought near by the belt fixture 32 of another side. Since it holds in the belt fixture 31 and the 32 fang furrow 37 in case the tension of a belt is adjusted, adjustment migration of the belt fixtures 31 and 32 can be easily carried out correctly with a predetermined posture along this slot 37.

[0031] Next, explanation of the procedure of conveying a work piece using an electromotive straight-line reciprocator carries a work piece for a slide block 15 on a slide block 15 in the condition of the longitudinal direction of drawing 1 and drawing 2 of on the other hand being located in an edge. If a motor 26 drives in this condition, a timing belt 25 will drive and a slide block 15 will be driven in the direction of a straight line. Thereby, a work piece is conveyed by the position of a longitudinal-direction another side edge.

[0032] Although the driving-side pulley 28 is formed in the crosswise center section of housing 10 when illustrating, a variation rate is carried out and you may make it form the driving-side pulley 28 in crosswise one side. Thereby, the near tooth space in which the motor 26 is not formed among the inferior surfaces of tongue of housing 10 can be used effectively.

[0033] When illustrating, the slot 37 is established in the front face of a slide block 15 to the crosswise both ends of a slide block 15, and you may make it conclude the belt fixtures 31 and 32 using which slot 37.

[0034] As mentioned above, although invention made by this invention person was concretely explained based on the gestalt of operation, it cannot be overemphasized that it can change variously in the range which this invention is not limited to the gestalt of said operation, and does not deviate from the summary.

[0035] for example, right and left among the both ends of the housing [in / in the driving-side pulley 28 / drawing 2] 10 -- you may make it prepare in which edge Moreover, although he is trying to install equipment horizontally in illustrating, you may make it install in a perpendicular direction or the inclination direction.

[0036]

[Effect of the Invention] It will be as follows if the effectiveness acquired by the typical thing among invention indicated in this application is explained briefly.

[0037] (1) The tension of the belt for changing rotation of . shaft into straight-line reciprocation of a slide block can be easily adjusted using a belt fixture, without moving a pulley.

[0038] (2) . -- tension can be adjusted easily, without disassembling equipment from the front face of a slide block on the occasion of this adjustment using a tool.

[0039] (3) Since . deer also prepared the belt as it surrounded the guide rail, the miniaturization of equipment can be attained.

[Translation done.]